Tung Do

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Education

University of Michigan, Ann Arbor, MI, USA August 2023-May 2025
Master of Science Graduation: May 2025
Major: Electrical and Computer Engineering, emphasis in Robotics
GPA: overall 3.9/4.0

California State Polytechnic University, Pomona, CA, USA August 2018-May 2023
Bachelor of Science Valedictorian - Graduation: May 2023
Major: Electromechanical Systems Engineering Technology
GPA: overall 3.69/4.0; Engineering-only 3.86/4.0

Publications

Shrestha, E., Wan, H., **Do, T.**, Rawal, M., Singh, S., & Vasudevan, R. (2024). Lucid Dreamer: Multimodal World Model for Zero-Shot Policy Transfer in Multi-Agent Autonomous Racing. Submitted to IEEE International Conference on Robotics and Automation (ICRA).

Research Experience

UM-Ann Arbor Field Robotics Group with Prof. Katherine A. Skinner December 2023-Present
Worked on *Intelligent Navigation of Autonomous Maritime Robots* as the second author

- Developed a URDF model for the Heron Unmanned Surface Vehicle (USV) in ROS2 and Gazebo Garden, creating a detailed simulation environment for testing autonomous marine systems in the Marine Hydrodynamics Lab.
- Prepared the Heron USV for real-world deployment by configuring battery, electrical, and mechanical systems; 3D-printed custom sensor mounts; and integrated LIDAR, camera, IMU, GPS, and odometry sensors through ROS for synchronized data acquisition.
- Designed and implemented an object avoidance algorithm in Python and C++, refining it through extensive testing in simulated and real-world environments, optimizing the USV's mechanical control systems for autonomous navigation.
- Conducted real-world testing under varying wave conditions, collected sensor data (LIDAR, camera, odometry, IMU), and replicated the data in simulation to analyze the stability and accuracy of autonomous navigation during tests such as "straight line" and "2 buoys."
- Engineered sensor data fusion by aligning laser/scan and odometry/filtered transform frames, ensuring accurate timestamp synchronization and transformations between frames for SLAM analysis in RViz using the Hector SLAM package.
- Designing a U-Net model for image segmentation to improve the USV's perception capabilities, post-processing collected data for reinforcement learning training, and configuring the camera URDF in real-world and simulated environments for precise control and navigation.

UM-Ann Arbor Robotics and Optimization for Analysis of Human Motion with Prof. Ram Vasudevan August 2023-September 2024
Worked on *Lucid Dreamer: Multimodal World Model for Zero-Shot Policy Transfer in Multi-Agent Autonomous Racing* as the third author

- Optimized the performance of the Jetson TX2 board to improve the efficiency of semantic segmentation tasks, reducing callback duration by fivefold and enhancing real-time processing for autonomous operations in dynamic environments.
- Developed a waypoint-follower algorithm for multi-agent experiments, utilizing the cartographer_ros package for map building and localization. This algorithm was crucial to reinforcement learning experiments by enabling precise navigation and path planning for multiple autonomous agents.
- Configured a teleoperation controller, conducted LIDAR scans, calibrated IMUs, and implemented SLAM using cartographer_ros, resolving critical frame transformation issues that enhanced system reliability and performance.
- Prepared robot hardware for real-world testing, including setting up the battery, electrical, and mechanical components. I customized and 3D-printed parts to accommodate sensors, then

connected and configured the sensors (LIDAR, camera, IMU, and odometry) through ROS for seamless data integration.

- Assisted in real-world testing, gathering critical sensor data—such as LIDAR, camera, odometry, IMU, and velocity measurements—focused on the robot's mechanical response and navigation control. This data was used to train and optimize a reinforcement learning model, improving the robot's autonomous capabilities.

Grad Course Projects

EECS 568 Mobile Robotics with Prof. Maani Ghaffari Winter 2024

- Collaborated with three graduate students to enhance vision-based SLAM systems by integrating shadow removal preprocessing techniques to improve object detection and mapping for UGVs in dynamic environments.
- Defined and addressed a research problem focused on the limitations of SLAM systems under shadows and changing illumination, testing algorithms like SpA-Former and LAB color space methods on KITTI and FinnForest datasets.
- Integrated and validated shadow removal techniques within the ORB-SLAM2 pipeline, significantly improving SLAM system accuracy and feature detection in complex, real-world environments.

ROB 535 Self Driving Cars with Prof. Maani Ghaffari Fall 2023

- Collaborated with two graduate students to enhance monocular 3D object detection for autonomous vehicles in foggy conditions, adapting the MonoCon model with transfer learning and advanced image processing techniques.
- Developed and implemented image augmentation strategies (contrast enhancement, CLAHE, and blurring) to improve detection accuracy and robustness in low-visibility environments, significantly increasing Average Precision (AP) from 7.05% to 25.82%.
- Conducted extensive evaluations using the KITTI dataset, demonstrating the model's improved performance in detecting distant and small objects, enhancing the reliability of autonomous vehicle perception systems in challenging weather conditions.

Industry Experience

PACCAR - Peterbilt Motors Company June 2024-August 2024

Advanced Mobility Tech Engineering Intern

- Led independent research and development to design, prototype, and test a fully functional robotic tool changer, contributing to advancements in industrial robotics with novel mechanisms for seamless operation and reliability.
- Designed and prototyped a self-aligning mechanism for automatic docking in dynamic industrial environments, achieving precise alignment and operational robustness to improve robotic system autonomy.
- Collaborated with senior engineers to refine technical designs, evaluate industry-grade components, and develop embedded control systems that automated critical processes, significantly enhancing operational efficiency and precision.

Skills

Robotics & Autonomous Systems: ROS, ROS2, RViz, Gazebo for simulation, SLAM (Hector SLAM, cartographer_ros), sensor fusion (Camera, LIDAR, IMU, GPS, Odometry), object avoidance algorithm, autonomous navigation
Machine Learning & Computer Vision: PyTorch, TensorFlow for reinforcement learning, U-Net image segmentation, OpenCV
Control & Embedded Systems: PID, Microcontrollers (STM32, Arduino PLC, NXP32), Single Board Computers (Nvidia Jetsons, Raspberry Pi), hardware interface (CAN, I2C, SPI)
Mechanical Design & Prototyping: SolidWorks, Creo Parametric, 3D printing, ANSYS FEA
Programming & Software: Python, C++, C, MATLAB, Linux, Bash/Shell Scripting, Git, Docker

Other Experience

Hexapod Robot for Multi-Terrain Exploration (Personal Project), *Robotics Engineer* Jun 2023
Bionic Arm (Personal Project), *Robotics Engineer* Jun 2023
CPP Northrop Grumman Collaboration Project, *Robotics Engineer* August 2022-May 2023

CPP Autonomous Robot Competition, *Lead Robotics Engineer* August 2022-December 2022
CPP NASA Student Launch 2023, *Parachute Team Lead* August 2022-October 2022
CPP Student Unmanned Aerial Systems Competition 2023, *Mechatronics Volunteer* September 2022
CPP BILL-EE - University Rover Challenge 2023, *Project Volunteer* August 2022
FPT USA Corp., *Embedded Software Engineer Intern* May 2022-August 2022
Autonomous/Remote Control Mecanum Wheel Tesla Roadster in Real-world Project, *Robotics Engineer* January 2022-December 2022
Rakuna - HR Tech Company, *Software Developer Intern* May 2021-July 2021

Honors and Awards

2023 CPP Valedictorian: Electromechanical Systems Engineering Technology
2019 CPP International Student Award Scholarship – $1,500
CPP Dean's Honor List: 2019, 2020, 2021, 2022; President's Honor List: 2020, 2021

Community Involvement

UM-Ann Arbor IEEE-HKN Beta Epsilon, *Membership pending* January 2024
IEEE Robotics and Automation Society, *Member* August 2023
CPP TBP CA Nu - The Engineering Honor Society, *Vice President* August 2022-December 2022
Prestige English Center, *Teaching Assistant* August 2020-January 2021

References

Prof. Ram Vasudevan
Associate Professor of Robotics Institute at UM-Ann Arbor, **Email:** ramv@umich.edu, **Tel:** (734) 647-5560.

Prof. Katherine A. Skinner
Assistant Professor of Robotics Institute at UM-Ann Arbor, **Email:** kskin@umich.edu

Mr. Gavin Coelho
Sr. System Architect Engineer of Peterbilt Motors Company at PACCAR Innovation Center, **Email:** gavin.coelho@paccar.com, **Tel:** (940) 273-0319.